

**DESCRIPTION OF THE MALE OF *BELOSTOMA*
FOVEOLATUM AND NEW RECORDS OF
B. COSTALIMAI AND *B. STOLLII*
(HETEROPTERA: BELOSTOMATIDAE)¹**

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ABSTRACT: The male of *Belostoma foveolatum* is described for the first time. This species can be distinguished from other species of the *B. dentatum* group by the length of the first rostral segment and features of the male genitalia, especially the dorsal arms of phallus. The relatively short anteoculus confirms a close similarity between *B. foveolatum* and *B. porteri*. *B. foveolatum* is newly recorded from the Brazilian states of Ceará and Mato Grosso do Sul, *B. costalimai* from the Brazilian states of Roraima and Pará, and *B. stollii* from the Brazilian states of Pará and Rio de Janeiro and the Bolivian Department of Santa Cruz.

The subfamily Belostomatinae can be distinguished from other subfamilies of Belostomatidae mainly by the sternites not being subdivided by a suture (Mahner 1993), and the peculiar egg-laying habit of females (Lauck and Menke 1961). According to Nieser (1975) and Lanzer-de-Souza (1980), *Belostoma* Latreille, 1807 has 70 described species, being most richly represented in tropical South America. Forty-two species are currently reported from Brazil (Lanzer-de-Souza 1980, 1992, 1996, Ribeiro 1999). *Belostoma* can be distinguished from other genera of Belostomatinae by the large membrane of hemelytra, the phallobase bifurcate dorsally, and dorsal arms of phallus extending nearly to apex of ventral diverticulum (De Carlo 1968, Nieser 1975).

Lauck (1962) started using the male genital structures for distinguishing species within *Belostoma*. In his study he proposed 16 groups of species based on features of the male genitalia. The species of the *Belostoma dentatum* group (*sensu* Lauck 1962) are large, varying in length from 38 to 52 mm, and present a distinct, very large ventroapical protuberance in the ventral diverticulum of the male genitalia (Lauck 1962, Estévez 1996). Nieser (1975) included in this group some species treated by Lauck (1962) in the *B. subspinosum* group. The *B. dentatum* group as defined by Nieser (1975) can be recognized by the length of the scutellum, reaching the nodal line, and by the ventral diverticulum of the genitalia, which presents ventral and dorsal protuberances apically. The following very closely related species are currently known in the group: *B. dentatum* (Mayr, 1863), *B. malkini* Lauck, 1962, *B. foveolatum* (Mayr, 1863), *B. harrisi* Lauck, 1962, and *B. porteri* De Carlo, 1942. This group is

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widely distributed in South America, being also found in Panama.

B. foveolatum was described from a single female specimen of unknown origin. De Carlo (1938), Lauck (1962), Schnack (1973) and Nieser (1975) redescribed this species based only on females. Although some authors referred to males of *B. foveolatum* in their studies, up to the present there is no description of the male for this species. During a revisional study of *Belostoma* from southeastern Brazil it was possible to describe male specimens of *B. foveolatum* and some genitalia variations which I have observed, as well as new South American records for this species, *B. costalimai* De Carlo, 1938, and *B. stollii* (Amyot and Serville, 1843).

MATERIAL AND METHODS

The description and new records are based on specimens deposited in the following institutions: American Museum of Natural History, New York (AMNH), Departamento de Parasitologia, Instituto de Ciências Biológicas, Universidade Federal de Minas Gerais, Belo Horizonte (DPIC), Departamento de Zoologia, Instituto de Biologia, Universidade Federal do Rio de Janeiro, Rio de Janeiro (UFRJ), Museo Argentino de Ciencias Naturales, Buenos Aires (MACN), Museu de Zoologia da Universidade de São Paulo, São Paulo (MZSP), Museu Nacional, Universidade Federal do Rio de Janeiro, Rio de Janeiro (MNRJ), Naturhistorisches Museum Wien, Vienna (NHMW), and Snow Entomological Museum, University of Kansas, Lawrence (SEMC). In quotations of label data, a comma separates different information and a point separates information on different specimens. Collectors and insect collection institutions are cited in parentheses.

Morphological terminology for head, thorax, abdomen, and male genitalia follows Dupuis (1955), Lauck and Menke (1961), Lauck (1962), Estévez (1996), and Ribeiro (1999). Techniques for removing the male genital structures follow those of Lauck (1962) and Estévez (1996). The dissected parts are stored in microvials with glycerin. Structures and methods of measurement are given in figures 1 - 6.

Belostoma foveolatum (Mayr)

(Figs. 7 - 10)

Zaitia foveolata Mayr, 1863: 355.

Zaitia foveolata: Berg, 1879: 192.

Belostoma foveolata: Kirkaldy and Torre-Bueno, 1909: 191.

Description of male. — Total length (from apex of head to apex of hemelytra at rest) 40.25 - 44.90 mm; largest width of body 15.00 - 19.50 mm; length of anteoculus 2.24 - 3.36 mm; length of anterior frontogenal suture (= anteclypeus - maxillary plate suture) 1.12 - 1.84 mm; length of posterior frontogenal suture (= anteclypeus - loral suture) 1.12 - 1.60 mm; length of interoculus 1.96 - 3.04 mm; posterior interocular width 2.52 - 3.68 mm; length of

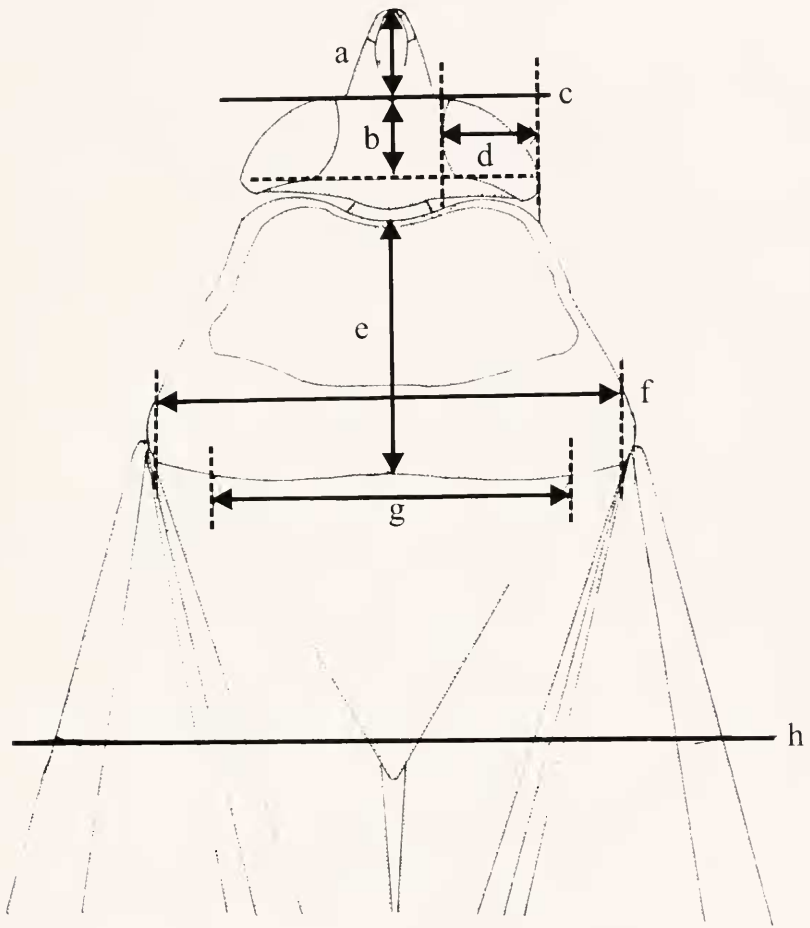
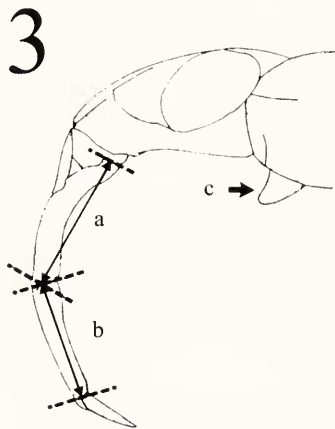
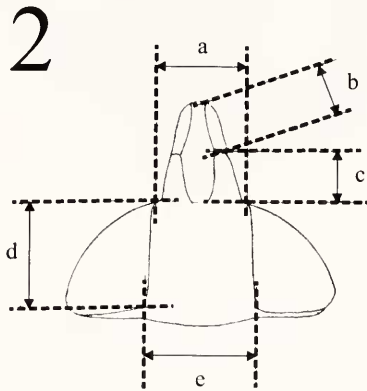
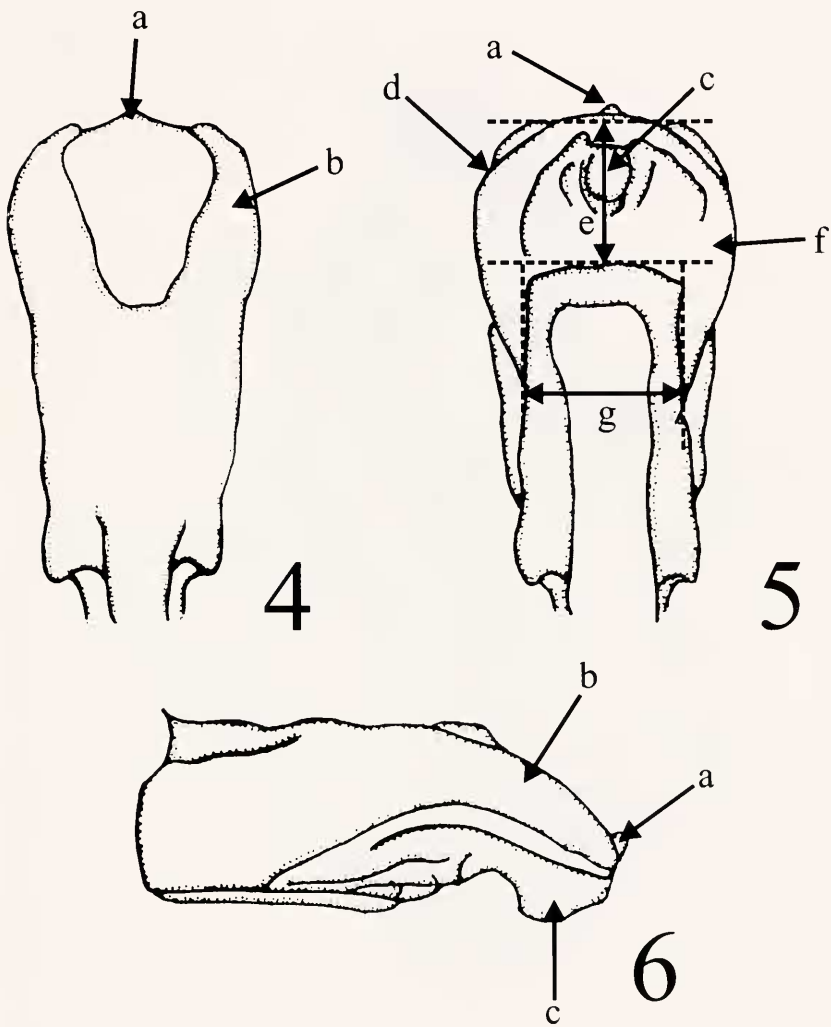


Fig. 1. External morphology of *Belostoma* Latreille, 1807 showing the major morphological features referred to in the taxonomic description. Dorsal aspect of head, pronotum and part of abdomen of *Belostoma*. a) length of anteoculus; b) length of interoculus; c) ocular line; d) width of an eye; e) length of pronotum; f) largest width of pronotum; g) width of scutellum; h) nodal line.



Figs. 2 and 3. External morphology of *Belostoma* Latreille, 1807 showing the major morphological features referred to in the taxonomic description. Fig. 2. Dorsal aspect of head of *Belostoma*. a) anterior interocular width; b) length of anterior frontogenal suture (= anteclypeus - maxilar plate suture); c) length of posterior frontogenal suture (= anteclypeus - loral suture); d); length of an eye; e) posterior interocular width. Fig. 3. Lateral aspect of head of *Belostoma*. a) length of segment I of rostrum; b) length of segment II of rostrum; c) prosternal keel.



Figs. 4 - 6. External morphology of *Belostoma* Latreille, 1807 showing the major morphological features referred to in the taxonomic description. Aspect of the phallus of *Belostoma* sp. Fig. 4. Dorsal view. Fig. 5. Ventral view. Fig. 6. Lateral view. a) dorsal apical protuberance; b) dorsal arms; c) ventroapical protuberance; d) caudal lateral margin of ventral diverticulum; e) length of ventral diverticulum; f) ventral diverticulum; g) width of ventral diverticulum.

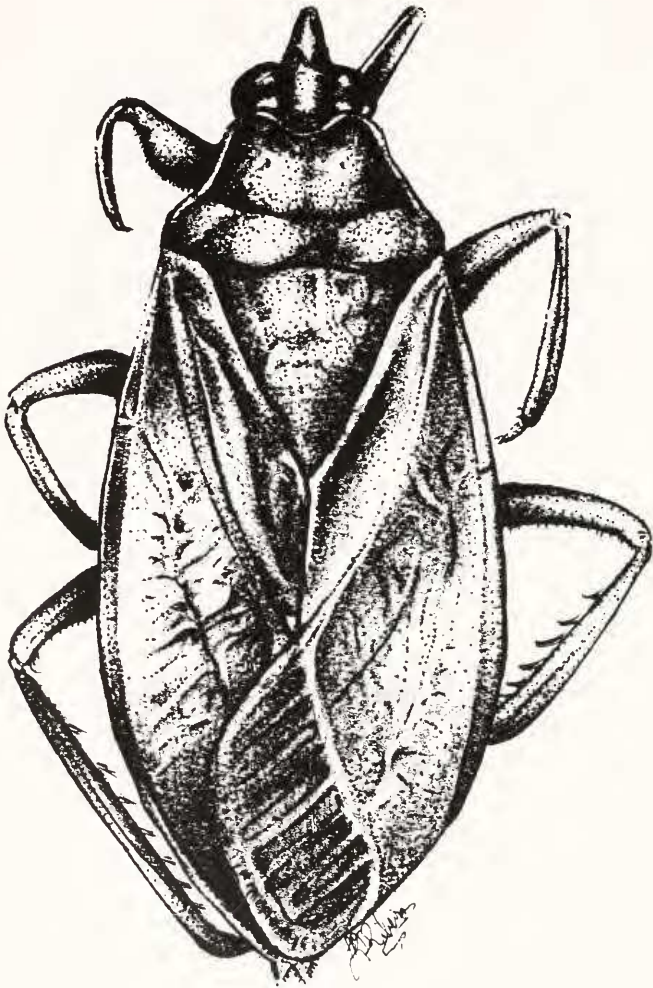


Fig. 7. Dorsal aspect of the male of *Belostoma foveolatum* (Mayr, 1863). Scale: 20.00 mm.

segment I of rostrum 3.04 - 4.80 mm; length of segment II of rostrum 2.38 - 4.24 mm; length of pronotum 6.16 - 8.08 mm; largest width of pronotum 11.06 - 14.48 mm.

General coloration nearly uniformly brown, occasionally suffused with yellowish brown. Pronotum with two yellowish longitudinal stripes, each parallel to lateral borders, pair of dark brown triangular marks adjacent to inner margins of longitudinal stripes. Abdominal venter yellowish brown. Legs with patches varying from darkish brown to reddish brown.

Body elongate and ellipsoid. Length of anteculus 0.94 - 1.14 times the length of interoculus. Clypeus reaching or nearly reaching the ocular line (0 - 0.24 mm). Anterior frontogenal suture equal to or longer than posterior frontogenal suture (1.00 - 1.25 times). Length of segment I of rostrum 1.13 - 1.29 times the length of segment II. Interoculus wider than long. Posterior interocular width 1.06 - 1.35 times the width of an eye, distinctly wider than the length of anteculus (1.05 - 1.24 times). Vertex without a longitudinal median carina. Eyes rounded, internal margins with a sulcus that does not extend to vertex. Pronotum and scutellum without a distinct median carina. Largest pronotum width 1.73 - 1.89 times its length. Scutellum reaching nodal line. Prosternal keel somewhat rounded (Fig. 8). Pilosity extending only slightly beyond eighth abdominal sternum, covering from about one to two-thirds of margin of connexivum.

Male genitalia (Fig. 9). — Dorsal arms are slightly broader at middle, not narrowing gradually toward apex in dorsal view. Phallus moderately symmetrical in dorsal view. Ventral diverticulum with a dorsal caudal protuberance in lateral view. Ventral diverticulum with a very large, distinct ventroapical protuberance in lateral and ventral views. Caudal lateral margins of ventral diverticulum are sinuses instead of convex in ventral view. Length of ventral diverticulum 1.0 time width in ventral view.

Variations (Fig. 10). — I have seen two specimens from the state of São Paulo, Brazil which have the total length and genitalia relatively bigger than other specimens examined, but which still possess distinct protuberances. However, dorsal arms are slightly broad at base, narrowing gradually toward apex in dorsal view. Caudal lateral margins of ventral diverticulum are not sinuses but convex.

Material examined. — One female [holotype] (NHMW): [without locality], [without date], [without collector], A. L. Montandon det. 1909, G. Mayr det. 1863. BRAZIL. State of Pará — One female (INPA 0020872): Curuauna [near Santarém], X-XI.1980, (R. C. Best), J. R. I. Ribeiro det. 1999. One female (SEMC): Lago Grande, II.1939, (A. M. Olalla), D. R. Lauck det. 1959. One male and two females (AMNH): Jacareacanga, VI.1970, (M. Alvarenga), J. R. I. Ribeiro det. 1999. State of Ceará — One female (AMNH): [without date], (Manin), J. R. I. Ribeiro det. 1999. One female (UFRJ 24): Pacatuba, Caracanga [Sítio Cajazeiras], 11.V.1986, (P. M. B. Carvalho), J. R. I. Ribeiro det. 1999. State of Mato Grosso do Sul — One male and two females (DPIC 567): Corumbá, 17.XI.1992, (Fabiana & T. P. S. Sereno), J. R. I. Ribeiro det. 1999. State of Minas Gerais — One male (DPIC 461): Belo Horizonte [reared in laboratory], [without date], (A. L. Melo), A. L. Melo det. One male (DPIC 1331): Calceolândia, II.1990, (A. L. Melo), A. L. Melo det. One male (DPIC 209): Lagoa Santa, [without date], (A. L. Melo), A. L. Melo det. One male (DPIC 409): Lagoa Santa, [without date], (A. L. Melo), A. L. Melo det. One male (DPIC 1618): Lagoa Santa [Lagoa Olhos d'Água], XII.1990, (M. H. Pereira), J. R. I. Ribeiro det. 1999. One male (DPIC 1620): Lagoa Santa [Lagoa Olhos d'Água], [without date], (M. H. Pereira), J. R. I. Ribeiro det. 1999. One male (DPIC 1606): Lagoa Santa [Lagoa Olhos d'Água], XII.1990, (M. H. Pereira), J. R. I. Ribeiro det. 1999. One male (DPIC 1607): Lagoa Santa [Lagoa Olhos d'Água], 22.IX.1988, (M. H. Pereira), J. R. I. Ribeiro det. 1999. One female (DPIC 210): Lagoa Santa [reared in laboratory], [without date], (A. L. Melo), A. L. Melo det. One male (DPIC 1249): Januária, 23.XI.1997, (A. L. Melo), J. R. I. Ribeiro det. 1999. State of São Paulo — One female (MZSP 70.032): rio Tietê, VIII.1996, (Bicego), J. A. De Carlo det. One male and one female (MZSP): Ribeirão Preto [Fac. Medicina], XI.1954, (Barretto) [coleção M. P. Barretto, 1969], J. R. I. Ribeiro det. 1999. One male (SEMC): [with

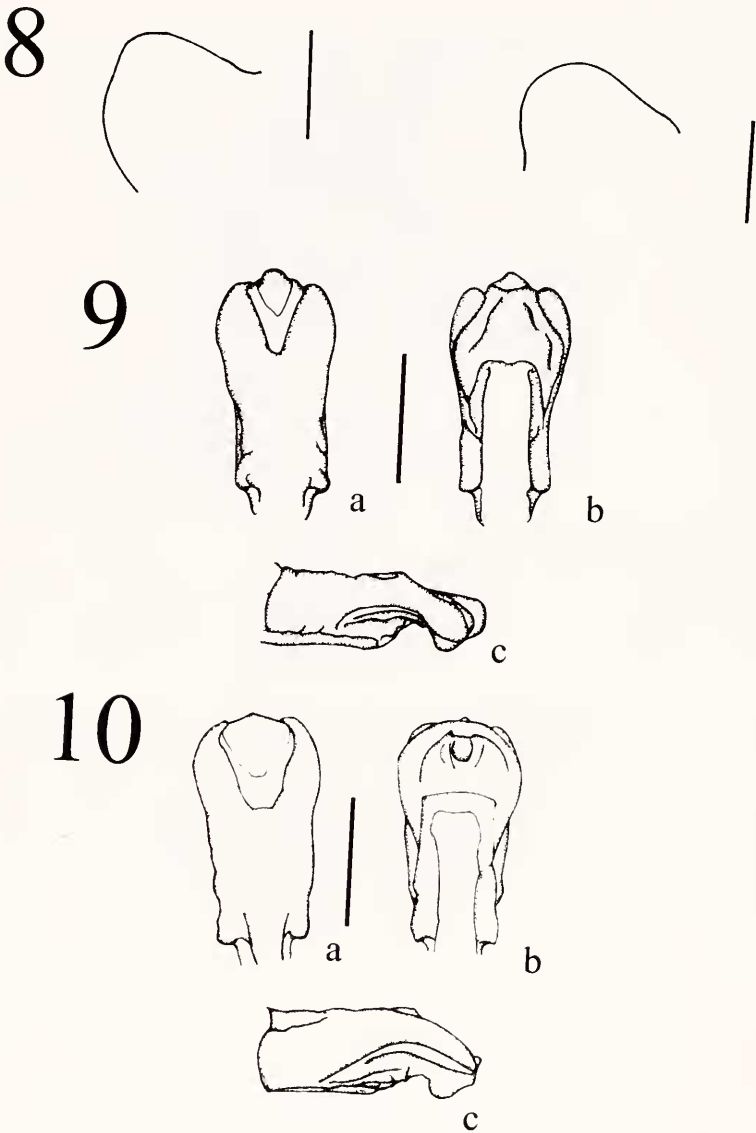


Fig. 8. Prosternal keel of *Belostoma foveolatum* (Mayr, 1863) (lateral view). Specimens from state of São Paulo, Brazil. Figs. 9 - 10. Phallus of *Belostoma foveolatum* (Mayr, 1863). Fig. 9. Specimen of Minas Gerais, Brazil. Fig. 10. Specimen from São Paulo, Brazil. a) dorsal view; b) ventral view; c) lateral view. Scales: 1.00 mm.

out date], (E. D. Tacwmsend), J. R. I. Ribeiro det. 1999. One female (SEMC 326): [without date], [without collector], A. L. Montandon det. 1914, D. R. Lauck det. 1959. Two males (MNRJ 85): São José dos Campos; XII.1934, (H. S. Lopes), J. A. De Carlo det. One female (MACN 39316): [without date], [illegible collector], J. A. De Carlo det. One male (MACN 39316): VIII.1960, [illegible collector], J. A. De Carlo det. One female (MACN 39316): I.1907, [illegible collector], J. A. De Carlo det.

Known distribution (Fig. 11). —The known distribution of the species now includes French Guyana (Cayenne) and Brazil (states of Pará — N., Ceará - Pacatuba [03° 58' S, 38° 37' W - new record] — NE., Mato Grosso do Sul - Corumbá [19° 01' S, 57° 39' W - new record] — central W., Minas Gerais, Rio de Janeiro, and São Paulo — SE.). Borneo (Lanzer-de-Souza 1980: 56) is clearly a erroneous record.

Notes. — The relatively short antecolus confirms a close relationship between *B. foveolatum* and *B. porteri*, as suggested by Nieser (1975). *B. foveolatum* can be distinguished from *B. elongatum* Montandon, 1908 by the relation of the length: width of the diverticulum in ventral view, which is about 1.3 times in *B. elongatum*. Finally *B. foveolatum* can be distinguished from the remaining species of the *B. dentatum* group (*sensu* Nieser 1975) by the length of segment I of the rostrum (including variations) and features of the male genitalia. In *B. foveolatum* the length of rostral segment I never exceeds 1.3 times the length of segment II, while segment I in the remaining species is at least 1.3 times longer than segment II. Moreover, the dorsal arms of the phallus in *B. foveolatum* are slightly broader at the middle, a characteristic that is not present in the other members of the *B. dentatum* group even though the dorsal arms of variants gradually narrow toward the apex in dorsal view.

New records of *Belostoma costalimai* De Carlo from Brazil

Belostoma costalimai De Carlo, 1938: 234.

B. costalimai has been reported from the Brazilian states of Goiás, Mato Grosso, Minas Gerais, Rio de Janeiro, and São Paulo (De Carlo 1938, Lauck 1964, Menke and Lauck 1962, Nieser and Melo 1997). Herein I report the following new records of *B. costalimai* in N. Brazil: state of Roraima, Boa Vista [2° 49' S, 60° 40' W] — one male (AMNH), 18.IX.1966, (M. Alvarenga), J. R. I. Ribeiro det., and state of Pará, Jacareacanga [6° 16' S, 57° 39' W] — one male and two females (AMNH), VI.1970, (M. Alvarenga), J. R. I. Ribeiro det. 1999 (Fig. 11).

New records of *Belostoma stollii* (Amyot and Serville, 1843) from South America

Zaitha stollii Amyot and Serville, 1843: 430 [type for *Zaitha*].

Belostoma stollii: Montandon, 1903: 240.

Belostoma stollii: Kirkaldy and Torre-Bueno, 1909: 192.

Belostoma stollii: Nieser and Melo, 1997: 61.

B. stollii has been reported from Guyana, Surinam, French Guyana, Venezuela, and the Brazilian states of Amazonas, Mato Grosso, and Minas Gerais (Amyot and Serville 1843, Kirkaldy and Torre-Bueno 1909, Lauck 1963, Nieser 1975, Lanzer-de-Souza 1980, Nieser and

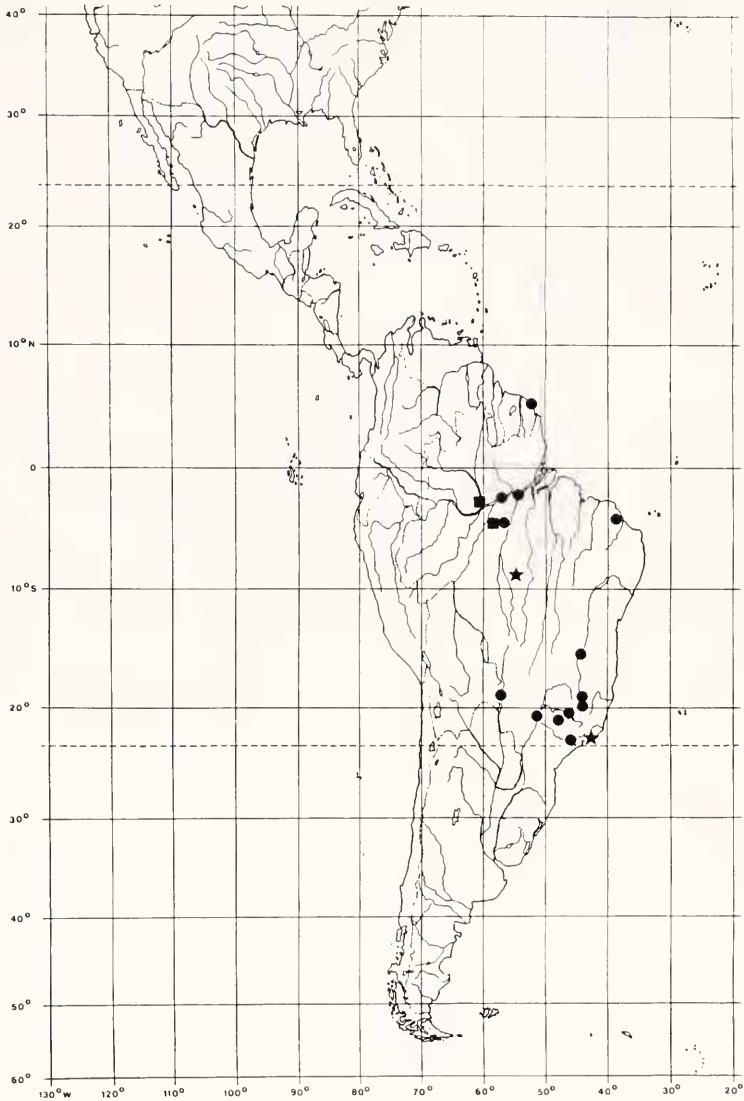


Fig. 11. Geographic distribution map for *Belostoma foveolatum* (Mayr, 1863), *B. costalimai* De Carlo, 1938 and *B. stollii* (Amyot and Serville, 1843) in South America. (● = *B. foveolatum*; ■ = *B. costalimai*; ★ = *B. stollii*). (Map radically compressed to show "true proportion" per Peter's projection.)

Melo 1997). Records from Guatemala, Chile, and southern Brazil were considered erroneous and based on misidentifications (Lauck 1963). Herein I report the following new records of *B. stollii* in South America: BRAZIL State of Pará, Cachimbo [8° 57' S, 54° 54' W] — one female (MNRJ 107), VI.1955, (J. A. Araújo), J. A. De Carlo det. [as *B. brasiliensis*], J. R. I. Ribeiro det. 1999. State of Rio de Janeiro, Magé, Citrolândia [22° 35' S, 43° 00' W] — one male (UFRJ 465), [without date], (H. W. Tavares), J. R. I. Ribeiro det. 1999. One male [with eggs on dorsum] (UFRJ 466), 14.II.1988, [without collector], J. R. I. Ribeiro det. 1999, and BOLIVIA. Dpto. Santa Cruz, Nueva Moka (untraced) — one female (MACN 53946), III.1955, (A. Martinez), J. A. De Carlo det. [as *B. brasiliensis*], J. R. I. Ribeiro det. 1999 (Fig. 11).

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